<u>CLAIMS</u>

1. A method for updating a file system snapshot, comprising:

accessing a first file system snapshot in a plurality of file system
5 snapshots, wherein the first file system snapshot includes data contents;

copying the data contents of the first file system snapshot, wherein the
data contents includes any one of:

at least one shadow inode and at least one data block referenced
by a disk address in a shadow inode; and

10 at least one shadow inode, and

writing the data contents which have been copied to a next oldest file
system snapshot.

2. The method of claim 1, wherein the copying of the data contents
15 comprises copying the data contents of the first file system snapshot, wherein
the data contents includes any one of:

at least one shadow inode, at least one indirect block referenced by
a shadow inode and at least one data block referenced by a disk address
in an indirect block; and

20 at least one shadow inode.

3. The method of claim 1, further comprising:

updating the data contents of the first file system snapshot in accordance
with modifications to at least one source file corresponding to the first file system
25 snapshot.

4.　　The method of claim 1, further comprising:

accessing a next most recent file system snapshot;

copying the data contents of the next most recent file system snapshot, wherein the data contents includes any one of:

5　　　　　at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

writing the data contents which have been copied to the first file system snapshot.

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5.　　The method of claim 4, wherein the copying of the data contents includes copying the data contents of the next most recent file system snapshot, wherein the data contents includes any one of:

at least one shadow inode, at least one indirect block referenced by

15　　a shadow inode and at least one data block referenced by a disk address in an indirect block; and

at least one shadow inode.

6.   A method for retrieving snapshot data, comprising:

accessing in a snapshot dataset a shadow inode corresponding to a source file;

determining whether the shadow inode includes a disk address;

5   wherein if the shadow inode includes a disk address, reading a data block referenced by the disk address;

wherein if the shadow inode does not include a disk address and a next most recent snapshot dataset exists, accessing the next most recent snapshot dataset and repeatedly executing the first accessing step, the determining step

10   and the second accessing step until the reading step is executed; and

wherein if the shadow inode does not include a disk address and a next most recent snapshot dataset does not exist, accessing a file system inode corresponding to the shadow inode and reading a data block referenced by a disk address in the file system inode.

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7.   The method of claim 6, further comprising:

wherein if the shadow inode includes a disk address, reading an indirect block referenced by the disk address and at least one data block referenced by at least one disk address in the indirect block.

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8.   The method of claim 6, further comprising:

wherein if the shadow inode does not include a disk address, accessing a next most recent snapshot dataset having the same ancestor as the first snapshot dataset and repeatedly executing the first accessing step, the

25   determining step and the second accessing step until the reading step is executed.

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9.   A system for updating a file system snapshot, comprising:

means for accessing a first file system snapshot in a plurality of file system snapshots, wherein the first file system snapshot includes data contents;

means for copying the data contents of the first file system snapshot,

5   wherein the data contents includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

means for writing the data contents which have been copied to a next

10   oldest file system snapshot.

10.   The system of claim 9, wherein the means for copying of the data contents comprises means for copying the data contents of the first file system snapshot, wherein the data contents includes any one of:

15   at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode.

11.   The system of claim 9, further comprising:

20   means for updating the data contents of the first file system snapshot in accordance with modifications to at least one source file corresponding to the first file system snapshot.

12.   The system of claim 9, further comprising:

means for accessing a next most recent file system snapshot;

means for copying the data contents of the next most recent file system snapshot, wherein the data contents includes any one of:

5   at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

means for writing the data contents which have been copied to the first file system snapshot.

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13.   The system of claim 12, wherein the means for copying of the data contents includes means for copying the data contents of the next most recent file system snapshot, wherein the data contents includes any one of:

at least one shadow inode, at least one indirect block referenced by

15   a shadow inode and at least one data block referenced by a disk address in an indirect block; and

at least one shadow inode.

14.   A system for retrieving snapshot data, comprising:

means for accessing in a snapshot dataset a shadow inode corresponding to a source file;

means for determining whether the shadow inode includes a disk address;

5   means for reading a data block referenced by the disk address;

means for accessing a next most recent snapshot dataset and repeatedly executing the first means for accessing, the means for determining and the second means for accessing until the means for reading is executed; and

means for accessing a file system inode corresponding to the shadow

10   inode and reading a data block referenced by a disk address in the file system inode.

15.   The system of claim 14, further comprising:

means for reading an indirect block referenced by the disk address and at

15   least one data block referenced by at least one disk address in the indirect block.

16.   The system of claim 14, further comprising:

means for accessing a next most recent snapshot dataset having the same ancestor as the snapshot dataset and repeatedly executing the first means

20   for accessing, the means for determining and the means for reading.

17.   A computer readable medium including computer instructions for updating a file system snapshot, the computer instructions comprising instructions for:

accessing a first file system snapshot in a plurality of file system snapshots, wherein the first file system snapshot includes data contents;

5   copying the data contents of the first file system snapshot, wherein the data contents includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

10   writing the data contents which have been copied to a next oldest file system snapshot.

18.   The computer readable medium of claim 17, wherein the copying of the data contents comprises copying the data contents of the first file system

15   snapshot, wherein the data contents includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode.

20   19.   The computer readable medium of claim 17, further comprising instructions for:

updating the data contents of the first file system snapshot in accordance with modifications to at least one source file corresponding to the first file system snapshot.

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20. The computer readable medium of claim 17, further comprising instructions for:

accessing a next most recent file system snapshot;

copying the data contents of the next most recent file system snapshot,

5   wherein the data contents includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

writing the data contents which have been copied to the first file system

10   snapshot.

21. The computer readable medium of claim 20, wherein the copying of the data contents includes copying the data contents of the next most recent file system snapshot, wherein the data contents includes any one of:

15   at least one shadow inode, at least one indirect block referenced by a shadow inode and at least one data block referenced by a disk address in an indirect block; and

at least one shadow inode.

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22.   A computer readable medium including computer instructions for retrieving snapshot data, the computer instructions comprising instructions for:

accessing in a snapshot dataset a shadow inode corresponding to a source file;

5   determining whether the shadow inode includes a disk address;

wherein if the shadow inode includes a disk address, reading a data block referenced by the disk address;

wherein if the shadow inode does not include a disk address and a next most recent snapshot dataset exists, accessing the next most recent snapshot

10   dataset and repeatedly executing the first accessing instructions, the determining instructions and the second accessing instructions until the reading instructions are executed; and

wherein if the shadow inode does not include a disk address and a next most recent snapshot dataset does not exist, accessing a file system inode

15   corresponding to the shadow inode and reading a data block referenced by a disk address in the file system inode.

23.   The computer readable medium of claim 22, further comprising instructions for:

20   wherein if the shadow inode includes a disk address, reading an indirect block referenced by the disk address and at least one data block referenced by at least one disk address in the indirect block.

24.   The computer readable medium of claim 22, further comprising instructions for:

wherein if the shadow inode does not include a disk address, accessing a next most recent snapshot dataset having the same ancestor as the snapshot dataset and repeatedly executing the first instructions for accessing, the instructions for determining and the second instructions for accessing until the instructions for reading are executed.

25.   A system for updating a file system snapshot, comprising:

a first file system snapshot in a plurality of file system snapshots, wherein the first file system snapshot includes data contents;

data contents of the first file system snapshot, wherein the data contents

5   includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

means for writing the data contents to a next oldest file system snapshot.

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26.   The system of claim 25, wherein the data contents includes any one of:

at least one shadow inode, at least one indirect block referenced by a shadow inode and at least one data block referenced by a disk address in an indirect block; and

15   at least one shadow inode.

27.   The system of claim 25, further comprising:

a next most recent file system snapshot;

data contents of the next most recent file system snapshot, wherein the

20   data contents includes any one of:

at least one shadow inode and at least one data block referenced by a disk address in a shadow inode; and

at least one shadow inode, and

means for writing the data contents to the first file system snapshot.

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28.   A system for retrieving snapshot data, comprising:

a shadow inode in a first snapshot dataset corresponding to a source file;

a disk address included in the shadow inode;

a data block referenced by the disk address;

5   a next most recent snapshot dataset.

29.   The system of claim 28, further comprising:

an indirect block referenced by the disk address; and

at least one data block referenced by at least one disk address in the

10   indirect block.

30.   The system of claim 28, further comprising:

a next most recent snapshot dataset having the same ancestor as the first

snapshot dataset.

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